CMPEN 271
Introduction to Digital Systems
Required Course in Computer Engineering and Computer Science

Catalog Data:  Introduction to Digital Systems (3)
Introduction to logic design and digital systems. Boolean algebra, and introduction to
combinatorial and sequential circuit design and analysis. Concurrent: Physics 202 or
Physics 212.


Course Objectives:  This course provides students with a basic understanding of digital logic devices and
digital circuit fundamentals. The students should be able to analyze and design both
combinational and sequential circuits after completing this course.

Primary Course Outcomes:  Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases,
signed integers, various codes such as ASCII, grey, and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates
of Boolean algebra.
- Be able to minimize combinational functions using either hand or electronic tools.
- Be able to design and analyze small combinational circuits.
- Be able to use standard combinational functions/building blocks to build larger more
complex circuits.
- Be able to design and analyze small sequential circuits and devices.
- Be able to use standard sequential functions/building blocks to build larger more
complex circuits.
- Be able to use some typical logic analysis and design tools.

Relationship to Undergraduate Program Outcomes:  CMPEN 271 is the first course in digital logic design and forms the foundation for the
rest of the program’s hardware and architecture courses. The course includes
introductions to a variety of topics that will be expanded on in later courses as well as an
introduction to the process of design and the use of design and analysis tools.

CMPEN 271 supports the following program outcomes:

- Design the electronic/logic circuits that form the basic building blocks of a computer
  system.
- Design the architecture and organization of the basic components of a computer
  system.
- Demonstrate independent learning by using unfamiliar computer systems, test
equipment and software tools to solve technical problems.
- Be able to discuss major trends in industry and current research activities within the
discipline.

Required Topics:  Number systems, base conversion and codes (1 week).
Boolean algebra (1½ weeks).
Combinational devices, circuit specification, minimization, and implementation (2
weeks).
Combinational logic subsystems (2 weeks).
Simulation software, HDL, and timing analysis (1½ weeks).
Sequential circuit devices and fundamentals (1 week).
Sequential circuit analysis and design (3 weeks).
Sequential logic subsystems (1 week).
Programmable devices, memory devices and the CPU (1 week).
Class Format: Three 50 minute lectures per week.

Professional Component: CMPEN 271 is the first course in digital systems. It lays the groundwork for many junior and senior level courses in architecture, switching theory, logical design and digital systems. Students are exposed to design problems that involve trade-offs in terms of speed, cost, and complexity. Students are introduced to design tools such as schematic capture, HDL description and/or digital simulation in the class.

Evaluation: Students are evaluated using 2 or 3 mid-term exams and a final exam. In addition students are required to complete 5-10 homework assignments on a variety of hardware and software problems. Some instructors may also give pop quizzes and/or an extended design project.

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